A Contemporary Concern Study on the

BEHAVIOURAL ASPECTS OF FINANCIAL ANALYSTS

Under the guidance of Prof. V Ravi Anshuman

By

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Abstract

Analysts are known to have systematic biases in their forecasts. Optimism, walking down the forecast, and an improvement in forecast with time are covered in literature. We test whether the size of the broker house an analyst works for impacts the extent of walkdown and improvement. It does not. We also test the impact of experience on optimism and accuracy. Experience is measured on three dimensions: experience with a specific company, a specific industry, and overall experience. We measure experience using number of days as well as number of forecasts. From these we conclude that analyst forecasts grow more accurate with time, and that they tend to grow more optimistic. We consider the same for broker houses, and conclude that they grow more accurate and optimistic only on some dimensions. Experienced analysts have a higher standard deviation of forecast error, while experienced broker houses have a lower standard deviation of forecast error. We then explain the usefulness of these results.

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Introduction

The world of analysts and investors is full of numbers and models used for decision-making. But the decision-makers are human beings. So it is likely that some biases do creep in the predictions of analysts as well as in the decisions by the investors. Behavioural Finance tries to capture this aspect.

Various researchers have studied whether any bias exists in recommendation of analysts and different aspects of such biases of analysts. In *Tracking Analysts' Forecasts over the Annual Earnings Horizon: Are Analysts' Forecasts Optimistic or Pessimistic?* Scott A. Richardson, Siew Hong Teoh and Peter David Wysocki record their observation that analysts put up an optimistic earnings forecast at the beginning of the year and walk down it through out the year. The estimate just before the earnings announcement tends to be slightly pessimistic so that on earnings announcement the investors get a pleasant surprise.

The extent of such a walkdown in earnings estimate would also depend on various characteristics of the analyst as well as the broker house. Examples of such characteristics could be size and experience of the broker house or experience of the analysts.

Also, logic suggests that the accuracy of the forecast of analyst should improve as the date of actual earnings announcement approaches. This would happen because of availability of more information. However, the pattern of improvement of earnings forecast might differ depending upon characteristics of the analyst and the broker house.

Conventional wisdom also suggests that with experience, analysts should tend to make better forecasts. Specifically, working on a specific company or industry for a long time would give analysts a better feel, and hence improve their forecast accuracy. Likewise, institutional knowledge is likely to have accumulated within broker houses. It is not intuitively obvious, however, as to whether there are synergies across industries. For example, does an analyst who has been analysing the auto industry for a long time have a better forecast accuracy in the pharma industry than a novice?

OBJECTIVES

Our literature search has not led us to any work done on the impact of experience or broker house size on forecast accuracy and walkdowns. Hence, we have taken up the task of determining, based on empirical evidence…

1. How the walkdown in earnings estimate varies for large and small broker houses.
2. How the earnings forecast accuracy improves and whether it differs for large and small broker houses.
3. How the experience of the analysts influences the optimism and the accuracy of the earnings estimate

4. How the experience of the broker house influences the optimism and the accuracy of the earnings estimate

SOURCES AND METHODOLOGY

We used the published research papers on behavioural aspects of analysts to understand biases in the behaviour of analysts. We also interviewed a few analysts to get an understanding of the psyche of the analysts. We have used data from I/B/E/S as our secondary source of data. The database in the I/B/E/S CD-ROM dated March 1997, contains:

1. Analyst by analyst estimates for nine years for various companies. Each record has I/B/E/S ticker code, fiscal period indicator, broker house code, analyst code, estimate date and estimated earnings.
2. Actual earnings of those companies are contained in another file. Each record in this file has I/B/E/S ticker code, fiscal period indicator, earnings announcement date and actual earnings.

We mapped the earnings estimate to actual earnings. Thus we had a sample of earnings forecasts. Each record had a company code, analyst code, broker house code, date of earnings estimation, estimated earnings, date of actual earnings announcement and actual earnings.

We used statistical tools for analysis of the data to test the hypotheses whether walkdown in earnings estimate and improvement in earnings estimate vary depending upon the various characteristics of the analysts and the broker houses.

The remaining report is divided into four sections. The first three sections discuss the impact of three different characteristics on the accuracy and walkdown of the earnings estimate. The last section talks about the conclusions.

Size of a broker house

HYPOTHESES

We tested the following hypotheses:

- Analyst walkdown their forecasts as the earnings announcement date approach.
- There is a significant difference between walkdown by small and large broker houses.
- Accuracy of the earnings estimate improve as the earnings announcement date approaches
- There is a significant difference between accuracy improvement by small and large broker houses.

DEFINITIONS

Period or Forecast Period

A forecast is an event when an analyst predicts the earnings of a company for a particular period. The date on which the forecast is made is the forecast date, and the date on which the earnings are released is the release date. The forecast period of a forecast is the number of days between the forecast date and the release date. In other words,

Forecast Period(F) = Release Date(F) – Forecast Date(F)

Error or Forecast Error

The error (also called forecast error) is the *signed* percentage difference between the forecasted earnings and the actual earnings. In other words,

Forecast Error(F) = (Forecast Earnings(F) – Actual Earnings(F)) ÷ Actual Earnings(F)

We also refer to forecast error as *optimism*. This is because when the forecast error is positive, the analyst is being optimistic about the company, while when the error is negative, the analyst is being pessimistic.

Absolute Error

The absolute error is the *unsigned* percentage difference between the forecasted earnings and the actual earnings. In other words,

Absolute Error(F) = | Forecast Error(F) |

Walkdown

The walkdown is the rate at which analysts' optimism (forecast error) decreases on a per-day basis. For each stock, zero or more analysts estimate the expected earnings per share at a time T (typically the year end). These estimates are made at various times (t) and could be revised over a period.

We define the forecast error an analyst makes at a time t in estimating the earnings of a company at time T as error(t,T)

$$walkdown(T) = \frac{error(\min(t), T) - error(\max(t), T)}{\max(t) - \min(t)}$$

Thus it is the per day difference in the earliest and the latest errors by an analyst for a company in a given forecast period. The earliest and latest errors are considered only within one year before the earnings announcement.

Improvement

The improvement is the rate at which analysts' absolute error (accuracy) decreases (improves) on a per-day basis. For each stock, zero or more analysts estimate the expected earnings per share at a time T (typically the year end). These estimates made be made at various times (t) and could be revised over a period. We define the absolute error an analyst makes at a time t in estimating the earnings of a company at time T as absError(t,T)

$$improvement(T) = \frac{absError(\min(t), T) - absError(\max(t), T)}{\max(t) - \min(t)}$$

Thus it is the per day difference in the earliest and the latest absolute error by an analyst for a company in a given forecast period. The earliest and latest absolute errors are considered only within one year before the earnings announcement.

Large broker house

A large broker house is defined as a broker house having analysts more than the median number of analysts.

Small broker house

A small broker house is defined as a broker house having analysts more than the median number of analysts.

METHODOLOGY

1. Errors and absolute errors are calculated for each forecast. Records with absolute errors greater than 200% are filtered out to eliminate outliers.
2. Walkdown and improvement is calculated for each combination of earnings announcement and analyst.
3. Mean, standard deviation and standard error is calculated for this sample.
4. The sample is divided into two parts, large broker houses and small broker houses as defined above. Mean, standard deviation and standard error is calculated for each of these samples.
5. For each of the sample hypotheses are tested whether walkdown and improvement are significant.
6. Hypothesis is tested whether walkdown and improvement are significantly different for large and small broker houses by doing a "Difference in means" tests.

RESULTS

Following table summarizes the results for walkdown. The walkdown is reported as percentage over the year.

Type	Walkdown	z-value
Small	30.76%	4.2272
Large	29.40%	11.5100
Overall	29.67%	11.8014
Difference in means	1.36%	0.1763

Since the z-values for all the three samples are significantly higher than the z-value at 0.01, we conclude at 99% confidence level that the walkdown in the forecasts of analysts is significant. Since the z value for difference in means is significantly lower than the z-value at 0.01, we conclude at 99% confidence level that the difference in walkdowns in the forecasts of analysts belonging to large and small broker houses is not significant.

Following table summarizes the results for improvement. The improvement is reported as percentage over the year.

Type	Improvement	z-value
Small	53.20%	9.10
Large	56.63%	26.65
Overall	55.94%	27.06
Difference in means	3.44%	0.55

Since the z-values for all the three samples are significantly higher than the z-value at 0.01, we conclude at 99% confidence level that the improvement in the forecasts of analysts is significant. Since the z value for difference in means is significantly lower than the z-value at 0.01, we conclude at 99% confidence level that the difference in improvements in the forecasts of analysts belonging to large and small broker houses is not significant.

OBSERVATIONS AND INTERPRETATIONS

1. Analysts walkdown their forecasts significantly.
2. Analysts' forecast error tends to drop by about 0.0008 every day, or about 7.3% a quarter.

This is a known result. The magnitude of the walkdown has been quantified here. However, given that it is a comparison of the first and the last values, it is not as good an estimate of walkdown as a regression result would be. A regression has been carried out and the results reported in the next section.

3. Accuracy of earnings forecasts by analysts improves significantly.
4. Analysts' forecasts improve by about 0.0015 every day, or about 13% a quarter.

This is also a known result. The magnitude of the improvement has been quantified here. However, given that it is a comparison of the first and the last values, it is not as good an estimate of improvement as a regression result would be. A regression has been carried out and the results reported in the next section.

5. Accuracy of earnings forecasts by analysts belonging to small as well as large broker houses improves significantly.
6. Improvement in accuracy for large broker houses is not significantly different from that for small broker houses.
7. Analysts belonging to small as well as large broker houses walkdown their forecasts significantly.
8. Walkdown in the forecasts by large broker houses is not significantly different from that by small broker houses.

From this, we infer that size of the broker house, at least as measured by the average number of analysts, does not significantly affect the walkdown or improvement. We hence eliminate size as a parameter that influences improvement and walkdown.

Experience of an analyst

HYPOTHESES

We tested the following hypotheses

- Accuracy of an estimate by an analyst, measured by absolute error is a function of his experience in tracking the firm, his experience in tracking an industry and his experience as an analyst.
- The optimism or pessimism in an analyst's estimate, measured by error is also a function of his experience in tracking the firm, his experience in tracking an industry and his experience as an analyst.
- The volatility of the accuracy as well as optimism is different for more experienced and less experienced analysts.

DEFINITIONS

Experience

There are three relevant experiences when each forecast is made.

1. The experience of the analyst with the company whose forecast is being made (covering the *company*)
2. The experience of the analyst in the industry of the company whose forecast is being made (covering the *industry*)
3. The overall experience of the analyst (covering *anything*)

The experience can be measured either by

1. Number of days the analyst has been covering the company/industry/anything
2. Number of forecasts the analyst has made about the company/industry/anything

Combinations of these result in six measures of experience defined below.

Experience for a company in days (ADaystic)

Experience of an analyst A in tracking a company C when making a forecast F is the difference between the earliest day when the analyst first made an earnings estimate for the company and date of given earnings forecast. This is experience in days. Thus for the first earnings forecast the experience would be zero.

$$ADaystic(F) = Forecast\ Date(F) - Earliest\ Date\ when\ analyst\ A\ made\ a\ forecast\ for\ company\ C$$

Experience for an industry in days (ADaysind)

Experience of an analyst A in tracking an industry I when making a forecast F is the difference between the earliest day when the analyst first made an earnings estimate for that industry and date of given earnings forecast. This is experience in days. Thus for the first earnings forecast the experience would be zero.

ADaysind(F) = Forecast Date(F) – Earliest Date when analyst A made a forecast for industry I

Experience for an analyst in days (ADaysanal)

Overall experience of an analyst when making a forecast F is the difference between the earliest day when the analyst first made an earnings estimate and date of given earnings forecast. This is experience in days. Thus for the first earnings forecast the experience would be zero.

ADaysanal(F) = Forecast Date(F) – Earliest Date when analyst A made a forecast on anything

Experience for a company in number of forecasts (ANumtic)

Experience of an analyst A in tracking a company C when making a forecast F is the number of forecasts made by that analyst for that company till and including the given earning forecast. This is experience in number of forecasts. Thus for the first earnings forecast the experience would be one.

ANumtic(F) = Number of forecasts by analyst A for company C until Forecast Date(F)

Experience for an industry in number of forecasts (ANumind)

Experience of an analyst A in tracking an industry I when making a forecast F is the number of forecasts made by that analyst for that industry till and including the given earning forecast. This is experience in number of forecasts. Thus for the first earnings forecast the experience would be one.

ANumind(F) = Number of forecasts by analyst A for industry I until Forecast Date(F)

Experience of an analyst in number of forecasts (ANumanal)

Overall experience of an analyst A when making a forecast F is the number of forecasts made by that analyst till and including the given earning forecast. This is experience in number of forecasts. Thus for the first earnings forecast the experience would be one.

ANumanal(F) = Number of forecasts by analyst A on anything until Forecast Date(F)

METHODOLOGY

The forecast error and forecast period was calculated for the 3.3 million records available on the CD. This data was filtered as follows:

1. Only those records with an analyst code were considered.
2. Only those records where forecast period was between 0 and 365 days were considered.
3. Top and bottom 2.5% of records, when arranged in ascending order of forecast error, were ignored so as to exclude the outliers. These referred to forecast errors less than –200% or greater than 350%.
4. All the analysts who made any forecasts in the first year of database were filtered out. This is because an estimate of their experience earlier to the start of database is not available.

After filtering, the number of records reduced to 409,783. The following analyses were performed on this data.

1. Absolute error was regressed against the forecast period and the experience of the analyst for the firm, for the industry and his overall experience in terms of days as well as in terms of number of forecasts. From our earlier tests, we have concluded that accuracy improves significantly as the forecast period reduces. Thus the variable "Forecast Period" is included to account for this effect.
2. Similarly, error was regressed against the forecast period and the experience of the analyst for the firm, for the industry and his overall experience in terms of days as well as in terms of number of forecasts. From our earlier tests, we have concluded that error reduces significantly as the forecast period reduces. This is the walkdown effect. Thus the variable "Forecast Period" is included to account for this effect.
3. This sample is divided into two sub-samples based on median value of each of the six experience variables. Means and variances are compared for each of the pair using t test and F-test respectively.

RESULTS

The results of the regression and the F test are summarised below. Mean of error and absolute error are in terms of % change per year (for regression against days) and % of change per forecast (for regression against number of forecasts). The significance of the results is given in brackets. The lower the significance, the more valid is the result. Shaded boxes represent results not significant at a 95% confidence level.

Variable	Beta (% per year) for[1]		For higher experience, diff in std dev of [2]	
	Absolute error is	Error is	Absolute error is	Error is
Period	21.721 (0.000)	12.425 (0.000)	-	-
ADaystic	-0.3384 (0.004)	-0.5256 (0.000)	+0.57 (0.014)	+0.18 (0.087)
ADaysind	-0.3383 (0.015)	-0.0084 (0.961)	+0.90 (0.000)	+0.43 (0.611)

[1] These are the regression results. Betas per day are converted to betas per year by multiplying by 365.
[2] The number here refers to standard deviation for higher experience – standard deviation for lower experience. The number is put just to give indication which standard deviation is higher.

ADaysanal	-0.0511 (0.628)	+0.6001 (0.000)	+0.98 (0.000)	+0.67 (0.488)

Variable	Beta (% per forecast) for		For higher experience, diff in std dev of Error: Reference source not found	
	Absolute error	Error	Absolute error is	Error is
Period	21.776 (0.000)	12.399 (0.000)	-	-
ANumtic	-0.0622 (0.000)	-0.0106 (0.197)	+0.75 (0.000)	+1.29 (0.000)
ANumind	-0.0031 (0.000)	-0.0009 (0.228)	-0.05 (0.131)	+0.31 (0.021)
ANumanal	+0.0022 (0.000)	-0.0001 (0.685)	+0.17 (0.000)	+2.17 (0.000)

R^2	Absolute error	Error
Days	0.015	0.003
Numbers	0.015	0.003

Observations and Interpretations

1. Absolute error reduces significantly with company and industry experience of the analysts. Thus accuracy improves with company and industry experience.
2. Absolute error reduces with overall experience of the analysts. However, this result is not statistically significant.

Hence, we conclude analysts learn from experience. The bulk of this learning comes from having a familiarity with the company and the industry being analyzed, but far less from their overall experience. So if a broker house wants to hire an analyst to cover an industry or a company, it should hire someone with *related* experience, specifically someone who has covered the specific company for a longer period.

The result also suggests that there are no synergies *across* industries. That is, an analyst who has worked in one industry for a long time is not significantly better than a novice, when tackling a fresh industry.

The following table illustrates what's happening:

When analysts analyze	Absolute error reduces		
The same company	0.73% a year	0.063% a forecast	
The same industry	0.39% a year	0.001% a forecast	
Different industries	0.05% a year	-0.002% a forecast	

So, on the whole, analysts learn something even if they do not work on the same industry.

3. Standard deviation of absolute error increases with any kind of experience. The result is statistically significant.

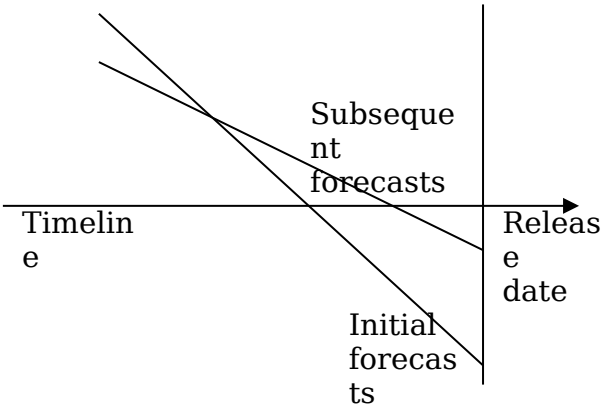
Hence, the volatility of forecasts increases with experience. In other words, a group of more experienced analysts are likely to have a wider spread of predictions than less experienced analysts. One interpretation of this could be the herding effect, which indicates that inexperienced analysts tend to follow each other's forecasts, and try not to deviate from it.

From the above, we see that more experienced analysts are on average more accurate. However, their forecasts tend to be more volatile. Our study has quantified the average accuracy improvement with number of forecasts and number of days in the industry. For example, all other things being equal, an analyst with a year's worth of experience in the industry is likely to make 0.39% less error in prediction.

Another interpretation of this result is that experienced analysts are put to work on companies whose earnings are intrinsically more volatile. However, given the data in our possession, we were unable to carry out this analysis.

4. The longer analysts work with a company, the less their forecast error is. However as they mature in their profession, the forecast error tends to increase.

Analysts walk down their forecasts. As we can see from the regression results, the average walkdown is about 12.4% per year over the forecast period. As a result, analysts begin their forecasts optimistically and end their forecasts pessimistically. The longer they work with the company, the less seems to be their initial optimism. Specifically, analysts reduce their initial optimism by about 0.53% each year. Since they also have a better forecast



accuracy, we conclude that their forecast profile has shifted as follows.

The following table summarizes this. Cells in gray are results that are not statistically significant.

When analysts analyze	Error increases
The same company	0.066% a year
The same industry	0.592% a

	year	
Different industries	0.600% year	a

Among these, however, the overall experience is the dominant effect. Thus, with time, analysts tend to become more optimistic. If they stick to a single company, this effect is not significant. But if they shift industries, this effect would be noticeable. This higher optimism across industries could be one reason why their forecast accuracy improvement is lower across industries than within the same industry.

5. Analysts tend to become less optimistic the longer they work on an industry. This result, however, is not statistically significant.
6. The longer analysts work, the more optimistic they tend to become. This result is statistically significant only when considered in terms of time, and not number of forecasts.

Hence, we cannot say much in terms of the impact of working on a particular industry for a long time. It appears that more experienced analysts are more optimistic, though.

7. Analysts become more unpredictable in terms of optimism as they become more experienced. The variance is consistently higher for high experience. However, the results are significant only for number of forecasts, not number of days.

It appears, therefore, that the volatility of optimism is higher among more experienced analysts than among less experience ones.

Experience of broker house

HYPOTHESES

We tested the following hypotheses

- Accuracy of an estimate, measured by absolute error is a function of experience of the broker house in tracking the firm, in tracking an industry and overall experience.
- The optimism or pessimism in an estimate, measured by error is also a function experience of the broker house in tracking the firm, in tracking an industry and overall experience.
- The volatility of the accuracy as well as optimism is different for more experienced and less experienced broker houses.

DEFINITIONS

Experience

There are three relevant experiences when each forecast is made.

1. The experience of the broker house with the company whose forecast is being made (covering the *company*)
2. The experience of the broker house in the industry of the company whose forecast is being made (covering the *industry*)
3. The overall experience of the broker house (covering *anything*)

The experience can be measured either by

1. Number of days the broker house has been covering the company/industry/anything
2. Number of forecasts the broker house has made about the company/industry/anything

Combinations of these result in six measures of experience defined below.

Variable	Meaning
BDaystic(F)	Analogous to ADaystic(F), with analyst replaced by broker house
BDaysind(F)	Analogous to ADaysind(F) , with analyst replaced by broker house
BDaysanal(F)	Analogous to ADaysanal(F) , with analyst replaced by broker house
BNumtic(F)	Analogous to ANumtic(F) , with analyst replaced by broker house
BNumind(F)	Analogous to ANumind(F) , with analyst replaced by broker house
BNumanal(	Analogous to ANumanal(F) , with analyst replaced by

F)	broker house

METHODOLOGY

The forecast error and forecast period was calculated for the 3.3 million records available on the CD. This data was filtered as follows:

1. Only those records with a broker house code were considered for this analysis.
2. Only those records where forecast period was between 0 and 365 days were considered.
3. Top and bottom 2.5% of records, when arranged in ascending order of forecast error, were ignored so as to exclude the outliers. These referred to forecast errors less than –200% or greater than 350%.
4. All the broker houses that made any forecasts in the first year of database were filtered out. This is because an estimate of their experience earlier to the start of database is not available.

After all these filtering, the number of records reduced to 691,054. The following analyses were performed on this data.

1. Absolute error was regressed against the forecast period and the experience of the broker house for the firm, for the industry and his overall experience in terms of days as well as in terms of number of forecasts. From our earlier tests, we have concluded that accuracy improves significantly as the forecast period reduces. Thus the variable “Forecast Period” is included to account for this effect.
2. Similarly, error was regressed against the forecast period and the experience of the broker house for the firm, for the industry and his overall experience in terms of days as well as in terms of number of forecasts. From our earlier tests, we have concluded that error reduces significantly as the forecast period reduces. This is the walkdown effect. Thus the variable “Forecast Period” was included to account for this effect.
3. This sample was divided into two sub-samples based on median value of each of the six experience variables.
4. Means and variances were compared for each of the pair using t-test and F-test respectively.

RESULTS

The results of the regression and the F test are summarised below. Mean of error and absolute error are in terms of % change per year (for regression against days) and % of change per forecast (for regression against number of forecasts). The significance of the results is given in brackets. The lower the significance, the more valid is the result. Shaded boxes represent results not significant at a 95% confidence level.

Variable	Beta (% per year) for[3]	For higher experience, diff in std dev of [4]

[3] These are the regression results. Betas per day are converted to betas per year by multiplying by 365.

[4] The number here refers to standard deviation for higher experience – standard deviation for lower experience. The number is put just to give indication which standard deviation is higher.

	Absolute error	Error	Absolute error is	Error is
Period	19.312 (0.000)	11.782 (0.000)	-	-
BDaystic	+0.1012 (0.067)	-2.2949 (0.000)	-2.01 (0.000)	-2.04 (0.000)
BDaysind	-2.0440 (0.000)	+1.6633 (0.000)	-2.74 (0.000)	-3.59 (0.000)
BDaysanal	+0.9001(0.000)	-0.9089 (0.000)	-2.48 (0.000)	-3.24 (0.000)

Variable	Beta (% per forecast) for		For higher experience, diff in std dev of Error: Reference source not found	
	Absolute error	Error	Absolute error is	Error is
Period	20.633 (0.000)	10.669 (0.000)	-	-
BNumtic	-0.1750 (0.000)	-0.0514 (0.000)	-1.63 (0.000)	-1.00 (0.000)
BNumind	+0.0003 (0.000)	-0.0001 (0.378)	-0.56 (0.001)	+0.79 (0.000)
BNumanal	+0.0002 (0.000)	-0.0002 (0.000)	-0.02 (0.000)	+1.48 (0.000)

R^2	Absolute error	Error
Days	0.014	0.005
Numbers	0.024	0.016

Observations and Interpretations

1. When considering experience with a company, absolute error increases with days of experience (not significant), but decreases with number of forecasts (significant). When considering experience in an industry, it decreases with days of experience (significant) but increases with number of forecasts (significant).

We can conclusively say that for broker houses, there is strong learning with days of experience in the industry. The forecast accuracy clearly deteriorates with experience across industries. However, there is no conclusive evidence about learning with days of experience for the company.

2. Accuracy *deteriorates* as broker house get more experienced in terms of days. In terms of number of forecasts, the result is the same, although the deterioration is marginal.

Note that this does not indicate an absolute deterioration of results — rather that a part of the increased experience with the company and/or industry is offset by the overall experience. In other words, the broker houses have 'negative synergies' across companies and industries. The following table illustrates what's happening.

When broker houses analyze	Absolute error reduces	
The same company	1.04% a year	0.175% a forecast
The same industry	1.14% a year	0.000% a forecast
Different industries	-0.90% a year	0.000% a forecast

So, unlike analysts, broker houses don't learn by working across companies. But they learn a lot more when working on the same industry. Specifically, the improvement when working on a company (or industry) for an analyst was only 0.73% (0.39%) a year whereas for a broker house, it is 1.04% (1.14%) a year. This seems to strongly indicate intra-industry synergies in broker houses.

3. Volatility of absolute error is lower for more experienced broker houses. Thus broker houses become more predictable in terms of accuracy as they become more experienced.

In other words, the absolute errors of experienced broker houses are less spread out. This seems to indicate that with experience, broker houses tend to acquire certain practices that make their results more consistent. This is a possible indication of industry-wide practices. There is no conclusive evidence of these practices contributing to improvement in broker houses' forecast accuracy, however.

4. Forecast error decreases with company and overall experience of a broker house.

Unlike analysts, broker houses grow pessimistic with time. Their forecast accuracy, as we noticed, also drops, so it appears that institutional trends of forecast pessimism (at least in part) contribute to the reduced accuracy of forecasts.

The following table summarizes this. Cells in gray are results that are not statistically significant.

When broker houses analyze	Error increases	Error increases
The same company	-1.541% a year	-0.052% a forecast
The same industry	+0.754% a year	-0.000% a forecast
Different industries	-0.909% a year	-0.000% a forecast

5. Volatility of error is lower for more experienced broker houses when analyzing the same company. But it is higher when analyzing different companies.

Thus broker houses become more predictable in terms of optimism, the longer they work with the same company. As they shift companies, the

optimism becomes less predictable. This seems consistent with one hypothesized cause of walkdowns — that broker houses walk down the estimates so as to please the companies, and thereby get better access to information from the company. [5] The longer the relation of companies with broker houses, the more likely that a stable 'walkdown' relation emerges. However, across companies (even within the same industry), this need not be the case.

[5] Richardson et al.

Conclusions

SUMMARY

Our conclusions can be summarized as follows:

- Analysts exhibit walkdown and improvement. That is, their forecast error and absolute error decrease over forecast period.
- The size of the broker house that analysts work for does not impact the walkdown or improvement.
- Experience of analysts increases forecast accuracy. There is a large increase in accuracy against experience with the company and industry. There is a small increase in accuracy with overall experience. However, the variance of the absolute forecast errors is higher for experienced analysts.
- Analysts tend to grow more optimistic (i.e., their forecast error increases) with experience. However, the variance of the forecast errors is higher for experienced analysts.
- Broker houses have lower forecast errors against high industry experience, and the variance of forecast errors is also lower.

USEFULNESS

How much does experience contribute to forecast accuracy? We see that the R^2 for the regressions against experience range between 1.4% and 2.4%. Hence, only about 2% of the spread in forecast error can be explained by experience. Within this limited scope, however, we have traced some trends and made some conclusions.

Learning and Conformance

Analysts learn something even if they do not work on the same industry or the same company. However, broker houses do not.

Analysts learn the longer they work on the same industry. Broker houses learn even more, the longer they work on the same industry.

Analysts learn the longer they work on the same company. For broker houses, the result appears inconclusive.

Hence, there is strong individual learning in the equity research business. Organizational learning occurs strongly when focusing on an industry, but not otherwise.

Analysts tend to conform less to each other's forecasts, as they grow more experienced. Broker houses tend to conform more. The former may be a consequence of herding — a phenomenon where less experienced analysts consult each others' forecasts, and base their own forecasts on the

consensus. Experienced analysts tend to do this less, given their confidence. The consensus among broker houses could be a result of industry-wide practices evolving. However, these are untested hypotheses.

How Broker Houses Should Hire Analysts

A more experienced analyst is better than a less experienced one, but only by virtue of having better prediction skills with regard to a company or an industry. Hence, broker houses should determine what industry or company they need to analyze, and recruit a person with more experience based on this choice.

Each year of experience with a company improves forecast accuracy by 0.39%. Each year of experience with an industry improves forecast accuracy by another 0.39%. Depending on how much this is worth to the broker house, they may hunt for analysts with the appropriate experience.

Experienced analysts also tend to be more volatile. While, on average, a more experienced analyst is better, there is more volatility among the experienced analyst. Broker houses should therefore take greater care during the selection process for an experienced analyst vis-à-vis a fresher.

These results would also help the broker houses decide about job rotation of analysts.

However, the contribution of experience towards the volatility of prediction is fairly small ($R^2 < 2\%$), and hence is not a paramount consideration.

How Investors Should Seek Advice From Analysts

When looking at analyst forecasts for a particular company, the ones from an analyst who has been covering the company for a long time are likely to be the most accurate. On average, analysts' forecast increases by 0.73% each year. If there are no experienced analysts covering the company, an analyst covering the same industry for a long period will suffice. Analysts improve about 0.39% each year. So, for example, a 10-year veteran of the auto industry, when compared with a 4-year novice covering Honda, would be 10 x 0.39% - 4 x 0.73% = 0.98% better (on average). (Investors might do well to remember that this 0.98% improvement is on a 2% contribution of experience to accuracy, though.)

A more significant effect is walkdown, and the effect of experience on it. Analysts, on average, walk down their forecast by 12.4% per year across the forecast period. Assuming that the walkdown occurs linearly down the year[6], analysts can adjust the forecast depending on the forecast date to get the nearest forecast. For example, if a forecast is made 6 months before the earnings release, the current forecast is likely to be 6.2% higher than compared to the final forecast. This gives investors an idea of how much to adjust analysts' forecasts by.

This effect, however, increases with time, especially when analysts analyze companies across industries. Investors should add 0.6% to the walkdown for every year of experience of the analyst, when estimating a company in an industry the analyst is unfamiliar with.

[6] This is not actually the case. See [Ref 6].

How Investors Should Hire Broker Houses

Investors should look for broker houses that have an industry focus. The longer a broker house has been in the industry, the better it is — even more than an analyst. For example, let's take an analyst with 5 years of automotive experience working in a firm with 2 years of auto experience. Compared with an analyst with 2 years of auto experience in a firm with 5 years of auto experience, the latter is likely to have a better forecast.

In sum, investors should just subscribe to the reports of a broker house with experience in their target industry. This is a low risk strategy, since experienced broker houses have less forecast error volatility.

LIMITATIONS AND FUTURE DIRECTIONS

- When eliminating size as a parameter that influences forecast error and walkdown, we assume that the average number of analysts accurately measures size over the 10-year period where data is available. However, this measure does not account for turnover of analysts in a broker house. Hence, an broker house with 100 analysts with a 50% turnover each year would have 550 unique analysts over 10 years, and would appear larger than a 500-analyst firm without turnover. A better measure for size needs to be used.
- One reason why experienced analysts' absolute errors are more volatile could be that are put to work on companies whose earnings are intrinsically more volatile. However, given the data in our possession, we were unable to carry out this analysis.
- Broker houses' forecasts conform to each other with experience. We have hypothesized that this is a result of industry-wide practices. However, herding is another explanation. We have been unable to test this hypothesis, nor come up with convincing explanations.
- Analysts grow optimistic with time. Broker houses grow pessimistic with time. However, while analysts' forecasts improve with this optimism, broker houses' forecasts degrade. The reasons for this are not known. Nor do we know if the pessimism is a cause of the degradation, and the extent of its contribution.
- We have calculated the change in optimism and accuracy with experience, but not the extent of walkdown or improvement. These would effectively measure the change in slopes of optimism and accuracy (against forecast period) with experience.
- The behavioral reasons for these results are unknown. We need to conduct interviews with analysts and broker houses to probe the reasons for these results.

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